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Woody Vegetation at Burgner Acres, East-Central Illinois: Composition and Changes Since 1964

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WOODY VEGETATION AT BURGNER ACRES, EAST-CENTRAL ILLINOIS:

COMPOSITION AND CHANGES SINCE 1964

(TITLE)

BY

Larry Philip Lehnen, Jr.

B.S. in Environmental Biology
Eastern Illinois University, 1980

THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

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IN THE GRADUATE SCHOOL, EASTERN ILLINOIS UNIVERSITY
CHARLESTON, ILLINOIS

1982

YEAR

I HEREBY RECOMMEND THIS THESIS BE ACCEPTED AS FULFILLING
THIS PART OF THE GRADUATE DEGREE CITED ABOVE

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DEPARTMENT CHAIRPERSON

CERTIFICATION OF COMPREHENSIVE KNOWLEDGE
FOR THE AWARDING OF A GRADUATE DEGREE

We certify that Larry P. Lehnen Jr. has successfully dem nstrated comprehension of her/his field of study and recommend that the degree Masters of Science in Environmental Biology be awarded.

[redacted]

Signatures of the Examining Committee

Date 5 May 1980

Adviser [redacted]

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WOODY VEGETATION AT BURGNER ACRES, EAST CENTRAL ILLINOIS: COMPOSITION AND CHANGES SINCE 1964

BY

LARRY PHILIP LEHNEN, JR.

B.S. in Environmental Biology, Eastern Illinois University

1980

ABSTRACT OF A THESIS

Submitted in partial fulfillment of the requirements
for the degree of Master of Science in Environmental Biology
in the Graduate School, Eastern Illinois University

CHARLESTON, ILLINOIS

1982

ABSTRACT

A comparative study was undertaken of the changes in woody vegetation of Burgner Acres during the past 18 years. This ten acre woodlot, located in east-central Illinois was surveyed using a method identical to that of a previous study. A literature review describing the composition of three general types of forests in the Grand Prairie Division of Illinois is included.

Twenty-five arborescent species are present on the study site with white ash (Fraxinus americana L.) maintaining its position as first in importance value (I.V. = relative frequency + relative density + relative dominance). Hackberry (Celtis occidentalis L.) has increased from fourth to second in importance, displacing elm (Ulmus sp. L.) to third. Shagbark hickory (Carya ovata [Mill.] K. Koch.) and black walnut (Juglans nigra L.) show a decrease in relative values.

A decrease in elm mortality and in the importance of red haw (Crataegus mollis [Torr. & Gray] Scheele.) has resulted in an increase in the relative importance of white oak (Quercus alba L.). Little recruitment of seedling and sapling white oak into larger diameter classes has occurred, indicating probable senescence of this species. Sugar maple (Acer saccharum Marsh.) has become well established in a part of the woodlot and it is suggested that it

will become a codominant due to its superior gap phase replacement potential.

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WOODY VEGETATION AT BURGNER ACRES, EAST-CENTRAL ILLINOIS: COMPOSITION AND CHANGES SINCE 1964

LITERATURE REVIEW

East-central Illinois lies in the Prairie Penninsula section of the Oak-Hickory Forest of eastern North America (Braun, 1950). Schwegman (1975) designated the northern section of this area as the Grand Prairie Division based on topography, glacial history, soils, bedrock, natural vegetation, flora, fauna, and climate. The southern border of this division is marked by the terminal moraine of the Wisconsin stage of Pleistocene glaciation. This Shelbyville Moraine and the land north of it are covered by soil derived from the Wisconsin drift. The different soil types and topography within the Grand Prairie are reflected in different plant communities.

Forests of the terminal moraine have been studied by Ebinger (1968) and McClain and Ebinger (1968). In both studies _Quercus alba_ L. (white oak) is the most important tree, ranking first in both relative density (number of individuals) and relative dominance (basal area). Other important species include _Q. rubra_ L. (red oak) and _Q. velutina_ Lam. (black oak) which are represented by a few large individuals, and various _Carya_ spp. Nutt. (hickories). In both woodlots _Acer saccharum_ Marsh. (sugar maple) is commonly found in mesic areas along streams but in Baber Woods it is higher in importance and better distributed throughout the woodlot (McClain and Ebinger, 1968). Fraxinus americana L. (white ash) is present in both woodlots but is higher in importance in the more disturbed Sargents Woods (Ebinger, 1968).

The streams that dissect the terminal moraine carry water that drains from the northern prairie. It is generally thought that these streams were the major routes for forest invasion of prairie (Vestal, 1919; Gleeson, 1923; Woodard, 1925; Telford, 1926a). Gleeson (1912) concluded that the present forests of the prairie region were once part of a continuous system, but frequent fires destroyed areas of the forest except those areas protected on the west side by series of low, moist areas called sloughs. Fires favored expanses of prairie, resulting in two types of forest, streamside forests and isolated prairie groves.

The streamside forests range from a wet mesic association in the bottomlands to a xeric association on the uplands. Acer saccharinum L. (silver maple) is dominant in the bottomland forests along the Embarras River, followed by Populus deltoides Marsh. (cottonwood), A. negundo L. (box elder) and Salix nigra Marsh. (black willow) (Crites and Ebinger, 1969). Root et al. (1971) found F. pennsylvanica var. subintegerrima (Vahl) Fern. (green ash), Ulmus americana L. (American elm), Celtis occidentalis L. (hackberry), Juglans nigra L. (black walnut), Gleditsia triacanthos L. (honey locust), Q. macrocarpa Michx. (bur oak), Q. imbricaria Michx. (shingle oak) and Crataegus sp. L (hawthorn) present in the bottomlands of Hart Memorial Woods.

White, black, and red oaks become more important on higher areas of Allerton Park (Boggess and Geis, 1967) and Hart Memorial Woods (Root et al., 1971). Hickories, including _C. glabra_ (Mill.) Sweet. (pignut), _C. ovata_ (Mill.) K. Koch. (shagbark), _C. tomentosa_ (Poir.) Nutt. (mockernut) and _C. cordiformis_ (Wang.) K. Koch. (bitternut) are also important along with _U. rubra_ Muhl. (slippery elm) and American elm. Other species include sugar maple, white ash, _Tilia americana_ L. (basswood), hackberry, green ash, _Prunus serotina_ Ehrh. (black cherry), _Sassafras albidum_ (Nutt.) Nees. (sassafras), black walnut, _F. quadrangulata_ Michx. (blue ash), _Morus_ sp. L. (mulberry), _Platanus occidentalis_ L. (sycamore) and _Cercis canadensis_ L. (redbud).

In Funk Forest, sugar maple was the dominant tree with white oak decreasing to second in importance (Boggess and Geiss, 1966). Slippery elm and American elm were common in the small diameter classes. Basswood and hackberry were also scattered throughout the woodlot. White, green and blue ash were common in the seedling strata but not among the larger diameter classes. This forest was considered intermediate between upland streamside forests and isolated prairie groves.

Prairie groves were studied by Boggess (1964) and Boggess and Bailey (1964). These groves are dominated by sugar maple with hackberry being second in importance. In Trealease Woods, white ash, slippery elm and basswood were third, fourth and fifth in importance respectively (Boggess, 1964). In Brownfield Woods, basswood and white ash were reversed as third and fifth in importance respectively, and _Aesculus glabra_ Willd. (buckeye) replaced slippery elm as fourth with slippery elm dropping to sixth in importance (Boggess and Bailey, 1964). Comparisons of Brownfield Woods with an earlier study (Telford, 1926b) revealed an increase in the basal area of ash and hackberry attributed to canopy openings resulting from elm mortality. White oak is absent in the prairie groves. Marberry et al. (1936) and Vestal and Heermans (1945) postulated that this could indicate a relatively recent invasion of prairie by forest.

INTRODUCTION

Burgner Acres is a 10 acre woodlot located approximately eight miles northwest of Charleston in Coles County, Illinois. It was donated to Eastern Illinois University in January 1955 by Mrs. Helen Burgner Douglas as a memorial to her father and grandparents who were pioneer settlers in the county. Since 1955 it has been maintained undisturbed except for a footpath and has been utilized for research and educational purposes. Shortly after the woodlot was acquired, six permanent quadrats were established (Henderson and Damann, 1966) and in 1962 six line transects were run by an ecology class to determine woody composition. In 1964 a complete survey of the woody vegetation was done (Blackmore and Ebinger, 1967) allowing for the analysis of even the less important tree species. This paper is a follow up to that study to determine woody vegetation changes over the past 18 years.

DESCRIPTION OF THE WOODLOT

Burgner Acres is located in the Grand Prairie Division of Illinois (Schwegman, 1975) three miles north of the Shelbyville Moraine in the SW¼, NE¼, of Section 1, T12N, R8E, Coles County, Illinois. It is located across the valley of Sycamore Creek, and has a gently rolling topography with a maximum difference in elevation of about 25 feet. Sycamore Creek divides the woodlot into three well defined study areas (Henderson and Damann, 1966). Area A slopes gradually south toward Sycamore Creek. Prior to acquisition of the woodlot by Eastern Illinois University, this area was frequently mowed. Area B is a somewhat less disturbed moist area which slopes to a second loop of the creek. Area C is a partially disturbed higher and drier area beyond the second loop of the creek. Two soil types are present in the woodlot. These are Yellow-Gray Silt Loam and Yellow Lilt Loam. Both are classified as upland timber soils (Smith et al., 1929).

MATERIALS AND METHODS

To facilitate direct analysis of vegetational changes, the method employed was that of Blackmore and Ebinger (1967). The entire woodlot was staked off into 50 feet square quadrats and the number, size and species of all trees four inches in diameter at breast height (d.b.h.) and over were recored. Relative density, relative dominance and relative frequency were then calculated using the following formulas:

$$\text{Relative density} = \frac{\text{Total individuals of a species}}{\text{Total individuals of all species}} \times 100$$

$$\text{Relative dominance} = \frac{\text{Total basal area of a species}}{\text{Total basal area of all species}} \times 100$$

$$\text{Relative frequency} = \frac{\text{Total plots of occurrence of a species}}{\text{Total plots of occurrence of all species}} \times 100.$$

The importance value (I.V.) (Curtis and McIntosh, 1951) was also calculated to provide a better basis for comparison of the various species (I.V. = Rel. den. + Rel. dom. + Rel. freq.). These values were calculated not only for the entire woods but also for each of the three areas outlined in the description of the woodlot. Dead standing trees were measured and identified when possible but only dead elm was used in the calculations because it comprised a relatively large part of the stand. The nomenclature used in this paper follows Jones (1963).

RESULTS

A total of 25 arborescent species were encountered on the woodlot. These species along with their density and frequency are shown in Table 1. The twelve leading species, with their relative values, average diameters and number of individuals per acre in broad diameter classes are shown in Table 2.

Of the arborescent species at Burgner Acres, white ash ranks first in importance value, having the highest relative frequency, relative density and relative dominance. It predominates in both the 4-6 inch and 7-12 inch diameter classes, firmly establishing its position as first in importance. Hackberry, which is second in importance, ranks close behind ash in both relative frequency and relative density but has considerably less basal area. The high number of individuals in the 4-6 inch and 7-12 inch diameter classes suggests that it will maintain its position of codominance with ash.

As no attempt was made to distinguish between slippery elm and American elm in the previous work, they were combined in the present study. Elm is third in number of individuals per acre in the 4-6 inch diameter class and in total individuals as well as third in importance. Dead elm accounts for 14% of all standing elm. This mortality which is due to phloem necrosis and Dutch elm disease effectively limits the importance of elm in the woodlot. If values for living and dead elm are summed, its importance slightly exceeds that of hackberry.

Black walnut, as fourth, only slightly exceeds shagbark hickory which is fifth in importance. This is due mainly to the larger size of individual trees. Shagbark hickory ranks higher than walnut in trees per acre in the smaller diameter classes and will probably surpass walnut in importance as these individuals mature.

White oak and mockernut hickory are sixth and seventh in importance respectively, primarily due to the large size of individual trees. Mockernut is not as large in diameter as white oak but it is somewhat more abundant. Bitternut hickory and shingle oak are present also in larger diameter classes but their low density results in a low importance value. Red haw and black cherry are present in the smaller diameter classes but their low basal area and relative sparseness results in a low importance.

If the three areas are taken separately, differences in the importance of some species are evident. Tables 3, 4 and 5 include the relative values, average diameters and number of individuals per acre in broad diameter classes in each of the three areas for the twelve leading species.

In Area A (2.4 acres) hackberry replaces ash as the most important species, with ash dropping to fourth in importance. Hackberry dominates in both the 4-6 inch and 7-12 inch diameter classes in both numbers and basal area. Elm is second in importance with 72%

of individuals occurring in the 4-6 inch diameter class. Elm mortality is highest in this area comprising nearly half of the total number of dead trees and over half of the dead basal area (Table 6). Black walnut is more common in this area than in the other two areas. Its position is mainly due to the larger size of individual trees. Shagbark is also represented by large individuals but ranks lower in importance here than in the entire woodlot. White oak, red haw, bitternut hickory, and mockernut hickory are lower in importance in this area than in the other areas, while black cherry and shingle oak rank somewhat higher.

Area B (3.8 acres) is more sloping and thus is better drained. White ash becomes most important with elm ranking second. Elm clearly dominates in terms of individuals per acre but mortality limits, and will probably continue to limit, the importance of elm. Hackberry ranks third in importance followed by shagbark hickory, which reaches its best development here. Mockernut and bitternut hickories, and white oak are also slightly more important, evidencing the drier nature of this area.

In area C (2.4 acres) which is the highest and driest area, white ash is again the most important species. Its importance value is far above any other species in the area. However mockernut hickory which is eleventh and tenth in Areas A and B is second in importance. White oak is elevated to third in importance due to the presence of large individuals. White oak is first in relative dominance in this area with an average diameter of 22.9 inches. Hackberry and elm are fourth and fifth in importance and are represented largely by individuals in the 4-6 inch diameter class.

Elm mortality is lowest in this area, constituting only 23.5% of dead individuals and 14.1% of the basal area. The importance of shagbark hickory only slightly exceeds that of walnut in this area.

DISCUSSION

Considerable changes in composition have taken place in the woodlot since 1964. Magnitude of change indices for comparing the three areas were computed as being the sum of the absolute value of change in importance rank of the present twelve major dominants from the previous study. If a species did not previously rank among the first twelve, it was considered to have changed from 0. Area A, with an index of 42, has undergone the most change, which is to be expected as it was originally the most disturbed. Index values for Areas B, C and the entire woodlot are 39, 29 and 37 respectively. Table 6 shows the percent change from the previous study in relative frequency, relative density, relative dominance and importance value of the present 10 major dominants. Care must be taken in interpreting these values, as they represent changes in relative values and not in absolute numbers.

White ash maintains its position as first in importance in the entire woodlot. It has more than doubled in individuals per acre and, while it has made increases in all three areas, its major increase has occurred in Area A. In this area it has gone from eighth to a present fourth in importance. The apparent lag in reproduction is possibly due to an inability of ash to germinate and compete in the years subsequent to the area having been mowed and grazed. Adequate germination and growth possibly occurred only after there was an accumulation of nutrient providing leaf litter, as the leaf litter of species such as elm is considered to be soil improving (Fowells, 1965).

Hackberry has increased from fourth to second in importance. Its present position as second to ash in individuals per acre suggests that it will continue as second in importance for a long period of time. This substantial increase has displaced elm to third in importance. Elm has increased primarily in basal area and is showing some recovery from suppression by phloem necrosis and Dutch elm disease. Elm mortality has decreased over 50% and the diameter of dead elm has decreased to an average of 6.5 inches. This is due to the fact that most of the larger elms had died previous to the original survey.

Black walnut has increased in relative dominance while experiencing a decrease in relative density. It has increased from fifth to fourth in importance due to an increase in basal area and also due to a decrease in the importance of shagbark hickory in the woodlot. Shagbark has increased slightly in number of individuals per acre but the relative value of this increase is negligable compared to increases in other species.

White oak has made a slight increase in individuals per acre over the past 18 years, primarily on Area C which is the driest of the three areas. The increase in importance of white oak has been primarily due to the decrease in two previously more important species. One of these, dead elm, has already been discussed. The other species is red haw. Mortality in red haw has been high (Table 7) with it comprising the third largest amount of dead basal area in the woodlot. Individuals per acre have decreased to less than half of what was present in the original survey. This decrease, as predicted by Blackmoore and Ebinger (1967), is largely a repsonse to canopy closure and an increase in understory density.

Other species responding negatively to the closure of the canopy are red mulberry and black cherry. Red mulberry ranked tenth in the previous study, but in this survey, no mulberry was found above four inches d.b.h., though a few dead individuals were observed (Table 7). Although black cherry now ranks with the leading twelve species where it did not previously, it has suffered high mortality, especially in Area A. Fowells (1965) classifies black cherry as an intolerant species unable to compete under a closed canopy.

Mockernut hickory maintains the same importance rank as it did in the previous work in Areas B and C but now occurs in Area A, increasing its overall importance. Bitternut hickory has maintained its relative position as tenth and shingle oak has replaced bur oak as one of the twelve dominants.

In the previous study, large numbers of sugar maple seedlings and saplings were noted on a portion of the slope to Sycamore Creek in Area C. Presently in Area C, sugar maple is represented by a total of 6.1 individuals per acre in the 4-6 inch and 7-12 inch diameter classes with an average diameter of 6.2 inches. Its importance value of 8.0 ranks it as tenth in importance when only Area C is considered.

Total trees per acre in the entire woodlot is somewhat higher than reports of other workers in east central Illinois (Boggess and

Bailey, 1964; Boggess and Geis, 1966; Ebinger, 1968; McClain and Ebinger, 1968) though higher densities have been reported for Allerton Park which was described by Boggess and Geis (1967) as essentially virgin. This higher density in Burgner Acres is probably the result of the past disturbances previously mentioned. Future changes in composition will result from a species ability to survive under a closed canopy with late sere competitive diversity.

White ash and hackberry will probably dominate in the woodlot for some time. Elm will continue to exhibit high mortality from phloem necrosis and Dutch elm disease. This will create canopy gaps for which elm will compete primarily with ash and hackberry. The superior gap phase replacement potential of sugar maple and its rapid establishment in Area C suggests that it will spread throughout Area C, and possibly throughout the entire woodlot, as is occurring in Sargents Woods (Ebinger, 1968) and Baber Woods (McClain and Ebinger, 1968). Black walnut is not reproducing well in the woodlot and will eventually decrease to a lower importance as large individuals die. Hickories will probably exhibit the same pattern, though shagbark will probably remain important longer as it is exhibiting better recruitment from the seedling and sapling strata.

White oak reproduction is not extensive because its seedlings are not suited for growth under a closed canopy. This species is destined to decrease in importance. It is conceivable that white oak will be eliminated completely from the woodlot. The far future implications of this sugest that sugar maple could rise to codominance with white ash, hackberry and elm. The composition of this streamside forest would then closely resemble the composition of prairie groves

(Boggess, 1964; Boggess and Bailey, 1964).

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Table 1. Density per acre and frequency of trees at Burgner Acres. The species symbol will be used to identify species in subsequent tables.

Scientific Name	Common Name	Species Symbol	Density	Fre- quency %
Fraxinus americana L.	White ash	WA	47.96	77
Ulmus sp. L.	Elm	E	37.17	74
Celtis occidentalis L.	Hackberry	H	42.29	69
Carya ovata (Mill.) K. Koch.	Shagbark hickory	SH	14.51	42
Juglans nigra L.	Black walnut	BW	10.92	38
Crataegus mollis (Torr & Gray) Scheele.	Red haw	RH	7.43	27
Ulmus sp. (dead)	Dead elm	DE	5.81	26
Carya tomentosa (Poir.) Nutt.	Mockernut hickory	MH	5.23	22
Quercus alba L.	White oak	WO	3.83	19
Carya cordiformis (Wang.) K. Koch.	Bitternut hickory	BH	4.19	15
Prunus serotina Ehrh.	Black cherry	BC	3.61	13
Gleditsia triacanthos L.	Honey locust	HL	1.51	7
Cercis canadensis L.	Red bud	RB	1.63	6
Quercus imbricaria Michx.	Shingle oak	SO	1.98	5
Maclura pomifera (Raf.) Schneider.	Osage orange	OO	1.16	5
Acer saccharum Marsh.	Sugar maple	SM	1.63	5
Quercus macrocarpa Michx.	Bur oak	BO	.93	5
Carya glabra (Mill.) Sweet.	Pignut hickory	PH	.24	1
Robinia pseudoacacia L.	Black locust	BL	.93	1
Platanus occidentalis L.	Sycamore	S	.46	1
Salix nigra Marsh.	Black willow	WL	.12	1
Quercus rubra L.	Red oak	RO	.23	1
Sassafras albidum (Nutt.) Nees.	Sassafras	Sa	.35	1
Acer negundo L.	Box elder	BE	.12	1
Tilia americana L.	Linden	L	.58	1

Table 2. Diameter classes, avetage diameter, relative values and importance value for leading dominants at Burgner Acres.

Species Symbol	Number of Trees Per Acre by Diameter Class 4-6	7-12	13-24	25+	Total	Ave. Diam.	Rel. Freq.	Rel. Den.	Rel. Dom.	I.V.
WA	30.4	12.9	3.5	1.2	48.0	7.6	16.6	24.6	20.5	61.7
H	28.8	12.1	1.1	.3	42.3	6.7	14.9	21.7	12.2	48.8
E	27.3	9.6	.2	-	37.1	6.2	16.0	19.1	8.3	43.4
BW	1.4	3.1	5.6	.8	10.9	14.2	8.2	5.6	14.2	28.0
SH	3.5	6.4	4.4	.2	14.5	11.1	9.1	7.4	11.4	27.9
WO	.8	.1	.9	2.0	3.8	21.8	4.1	2.0	11.6	17.7
MH	.3	1.6	3.3	-	5.2	14.0	4.8	2.7	6.0	13.5
RH	6.8	.6	-	-	7.4	5.2	5.9	3.8	1.1	10.8
DE	3.9	1.9	-	-	5.8	6.9	5.6	3.0	1.5	10.1
BH	1.5	1.6	1.1	-	4.2	10.0	3.3	2.2	2.8	8.3
BC	2.6	1.0	-	-	3.6	6.1	2.8	1.8	.8	5.4
SO	1.0	.6	.4	-	2.0	9.0	1.2	1.0	1.1	3.3
Others	4.8	3.2	1.3	.6	9.9	12.6	7.5	5.1	8.5	21.1
Total	113.1	54.7	21.8	5.1	194.7	-----	100.0	100.0	100.0	300.0

Table 3. Diameter classes, average diameter, relative values and importance value for the leading dominants in Area A at Burgner Acres.

Species Symbol	Number of Trees Per Acre by Diameter Class 4-6	7-12	13-24	25+	Total	Ave. Diam.	Rel. Freq.	Rel. Den.	Rel. Dom.	I.V.
WA	25.3	7.1	1.2	-	33.6	6.5	15.1	15.9	10.0	41.0
H	56.4	19.1	-	.4	75.9	6.2	20.4	35.8	22.1	78.3
E	31.5	11.2	.8	-	43.5	6.3	19.2	20.6	12.2	52.0
BW	4.6	8.3	7.5	1.2	21.6	11.7	12.2	10.2	23.3	45.7
SH	1.7	-	.8	.8	3.3	14.6	4.7	1.6	6.4	12.7
WO	1.2	-	1.2	-	2.4	14.3	2.3	1.2	4.5	8.0
MH	.4	-	-	-	.4	6.9	.6	.2	.1	.9
RH	2.1	-	-	-	2.1	4.7	2.3	1.0	.3	3.6
DE	3.7	4.2	-	-	7.9	7.3	7.6	3.7	2.9	14.2
BH	-	-	-	-	-	-	-	-	-	-
BC	5.4	2.5	-	-	7.9	6.2	5.8	3.7	2.0	11.5
SO	2.5	.8	-	-	3.3	6.4	2.3	1.6	1.0	4.9
Others	3.7	3.7	1.2	1.2	9.8	17.8	7.5	4.5	15.2	27.2
Totals	138.5	56.9	12.7	3.6	211.7	-----	100.0	100.0	100.0	300.0

Table 4. Diameter classes, average diameter, relative values and importance value for the leading dominants in Area B at Burgner Acres.

	Number of Trees Per Acre by Diameter Class									
Species Symbol	4-6	7-12	13-24	25+	Total	Ave. Diam.	Rel. Freq.	Rel. Den.	Rel. Dom.	I.V.
WA	14.9	12.6	5.6	2.3	35.4	10.0	15.4	19.3	25.8	60.5
H	19.5	11.0	1.5	.5	32.5	7.1	14.2	17.8	10.4	42.4
E	31.8	11.8	-	-	43.6	6.2	16.6	23.8	9.1	49.5
BW	-	1.5	4.4	.8	6.7	17.5	6.9	3.6	11.5	22.0
SH	5.9	10.0	7.2	-	23.1	10.7	12.1	12.6	16.2	40.9
WO	.3	.3	.5	1.8	2.9	24.2	3.3	1.5	9.5	14.3
MH	.3	2.0	1.5	-	3.8	11.2	4.2	2.1	2.7	9.0
RH	10.8	.8	-	-	11.6	5.1	7.8	6.3	1.6	15.7
DE	5.4	1.5	-	-	6.9	6.1	6.9	3.8	1.5	12.2
BH	2.8	2.3	.8	-	5.9	8.6	3.3	3.2	2.9	9.4
BC	1.3	.8	-	-	2.1	6.5	2.1	1.1	.5	3.7
SO	.8	.8	.8	-	2.4	11.2	1.2	1.3	1.8	4.3
Others	3.1	2.3	.8	.5	6.7	12.1	6.0	3.6	6.5	16.1
Totals	96.9	57.7	23.1	5.9	183.6	-----	100.0	100.0	100.0	300.0

Table 5. Diameter classes, average diameter, relative values and importance value for the leading dominants in Area C at Burgner Acres.

Species Symbol	Number of Trees Per Acre by Diameter Class 4-6	7-12	13-24	25+	Total	Ave. Diam.	Rel. Freq.	Rel. Den.	Rel. Dom.	I.V.
WA	62.3	19.6	2.2	.4	84.5	6.4	20.2	43.0	20.7	83.9
H	15.7	6.5	1.3	-	23.5	7.0	11.2	12.0	7.0	30.2
E	15.3	4.4	-	-	19.7	5.9	12.2	10.0	3.6	25.8
BW	.4	.4	5.7	.4	6.9	17.2	6.9	3.6	11.0	21.5
SH	1.3	7.0	3.5	-	11.8	11.1	8.0	6.0	7.8	21.8
WO	1.3	-	1.3	4.4	7.0	22.9	6.9	3.6	20.8	31.3
MH	.4	2.6	9.6	-	12.6	15.7	9.6	6.4	16.4	32.4
RH	5.2	.9	-	-	6.1	5.5	5.9	3.1	.9	9.9
DE	1.7	-	-	-	1.7	5.1	1.6	.9	.2	2.7
BH	.9	2.2	2.6	-	5.7	12.4	6.4	2.9	5.0	14.3
BC	1.7	-	-	-	1.7	4.8	1.1	.9	.2	2.2
SO	-	-	-	-	-	-	-	-	-	-
Others	8.8	4.4	2.2	-	15.4	9.4	10.0	7.6	6.4	24.0
Total	115.0	48.0	28.4	5.2	196.6	-----	100.0	100.0	100.0	300.0

Table 6. Percent change (+ or -) in relative values of the ten leading dominants in Burgner Acres since 1964.

	Species Symbol	Rel. Freq.	Rel. Den.	Rel. Dom.	I.V.
Woodlot	WA	+ 35	+ 57	+ 34	+ 43
	H	+ 37	+ 82	+135	+ 72
	E	+ 8	+ 15	+102	+ 22
	BW	--	- 13	+ 7	--
	SH	+ 2	- 24	- 14	- 13
	WO	+ 17	- 5	- 3	+ 1
	MH	+ 17	- 10	- 8	- 1
	RH	- 42	- 67	- 71	- 57
	DE	- 21	- 57	- 88	- 62
	BH	+ 22	+ 10	+ 12	+ 15
Area A	WA	+140	+212	+456	+211
	H	+ 13	+ 51	+135	+ 53
	E	+ 20	+ 56	+321	+ 62
	BW	- 2	- 13	+ 5	- 1
	SH	+ 34	- 48	- 34	- 23
	WO	+ 10	- 25	- 48	- 35
	MH	*	*	*	*
	RH	- 78	- 91	- 96	- 88
	DE	+ 21	- 53	- 85	- 57
Area B	WA	+ 22	+ 36	+ 14	+ 22
	H	+ 35	+ 78	+131	+ 69
	E	+ 6	+ 21	+ 82	+ 23
	BW	- 8	- 37	+ 6	- 8
	SH	+ 3	- 3	--	--
	WO	+ 10	- 21	- 7	- 5
	MH	+ 27	+ 11	- 33	- 2
	RH	- 16	- 53	- 53	- 40
	DE	- 4	- 48	- 87	- 54
	BH	+ 22	+ 68	+ 32	+ 40
Area C	WA	+ 24	+ 65	+ 62	+ 52
	H	+ 87	+ 88	+ 71	+ 82
	E	- 2	- 27	+ 13	- 13
	BW	+ 15	- 5	--	+ 3
	SH	- 2	- 36	- 25	- 22
	WO	+ 28	+ 20	+ 19	+ 21
	MH	+ 10	- 12	+ 4	+ 2
	RH	- 48	- 64	- 55	- 55
	DE	- 79	- 85	- 98	- 88
	BH	+ 31	- 24	+ 2	+ 5

*Previously absent in area.

Table 7. Number of individuals and basal area per acre of dead standing trees at Burgner Acres.

Species Symbol	Woodlot		Area A		Area B		Area C	
	NO.	B.A.	NO.	B.A.	NO.	B.A.	NO.	B.A.
DE	5.81	1.49	7.88	2.50	6.92	1.60	1.74	.26
WA	1.05	1.39	-	-	1.28	2.96	1.74	.20
RH	1.05	.45	1.24	.98	2.05	.26	1.31	.20
BC	1.05	.17	3.32	.56	.26	.04	-	-
RM*	.58	.09	-	-	.77	.13	.87	.12
OO	.46	.11	1.24	.28	.26	.07	-	-
RB	.46	.11	-	-	1.02	.24	-	-
SH	.35	.09	.41	.05	.26	.03	.44	.24
WO	.23	.21	-	-	-	-	.87	.77
BW	.23	.06	.41	.16	.26	.03	-	-
B**	.23	.05	.83	.18	-	-	-	-
BL	.23	.04	.83	.13	-	-	-	-
HL	.12	.02	-	-	-	-	.44	.06
MH	.12	.01	-	-	.26	.03	-	-
S	.12	.01	-	-	.26	.02	-	-
Totals	12.09	4.30	16.16	4.84	13.60	5.41	7.41	1.85

*<u>Morus rubra</u> L. (Red Mulberry)
**<u>Viburnum prunifolium</u> L. (Black Haw)